Report No. CG-D-09-90

LIFE CYCLE COST ANALYSES

OF

DAYBOARD SYSTEMS

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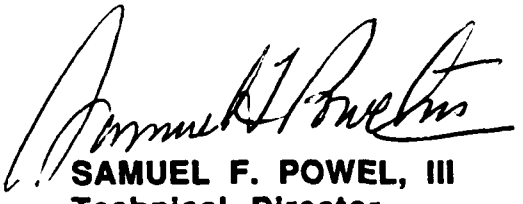

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16. Abstract

This report presents life cycle cost analyses on 13 possible dayboard systems. A dayboard system consists of the combination of backing, adhesive, and properly colored substrate necessary to construct navigational signs for the U.S. Coast Guard's aids-to-navigation system. Total dayboard construction costs are estimated for each system. These costs - combined with maintenance and repair costs - are projected for a 10 year period (1992-2001) assuming a 10% discount factor. Net present values (NPV) of each system are compared and range from $3.0M to $9.7M. The present system's NPV is $6.1M. Considering only construction costs, potential savings of a long life dayboard range from $150,000 to $580,000 per year. Supporting cost data and detailed cost calculations are included for each system in the Appendix.

The results of these analyses - together with information from a separate technical evaluation of dayboard materials - will aid in selecting the most cost effective dayboard system for the U.S. Coast Guard.

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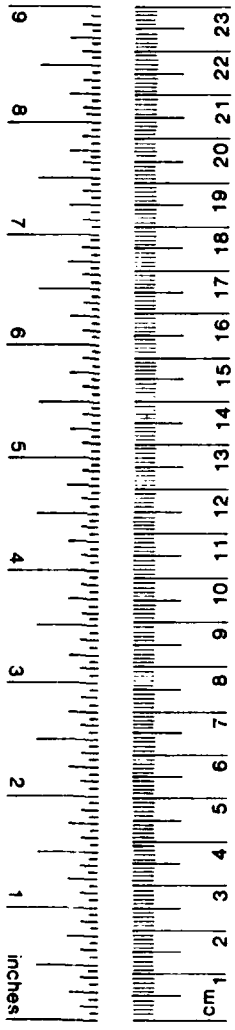
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

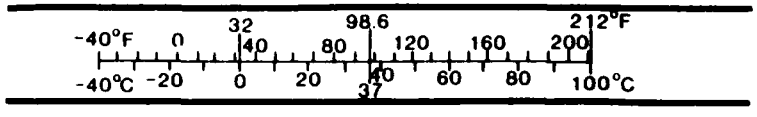
Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (WEIGHT)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (EXACT)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures. Price $2.25. SD Catalog No. C13.10:286



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (WEIGHT)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	0.125	cups	c
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (EXACT)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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1.0 INTRODUCTION

This report is the second in a series of reports which will provide information for the design of long life navigational signs for the U.S. Coast Guard. The focus of this report is life cycle cost analyses for dayboard systems. The objective of the life cycle cost analyses is to establish the total cost to the Coast Guard of implementing a new dayboard system. Emphasis in the report is presenting data in tabular format so that costs of competing dayboard systems can be easily compared.

A major assumption in the analyses is that the Coast Guard will continue to construct dayboards in the present manner. Estimating possible cost savings due to centralized production of dayboards or to contracting out of dayboards is beyond the scope of this report.

2.0 BACKGROUND

The U.S. Coast Guard currently has 38,634 dayboards installed throughout its Aids-To-Navigation system. With an average life expectancy of less than two years, half of these dayboards are replaced annually. Dayboard construction costs alone for this replacement effort are $967,000 as detailed in table II. Given present technology, new dayboard materials are available to construct long life dayboards. An increase in the lifetime of dayboards may result in substantial savings in personnel, ship, and material costs.

3.0 LIFE CYCLE COST ANALYSES

3.1 Method

Following the guidelines of NAVFAC P-442 "Economic Analysis Handbook", a life cycle cost analysis was completed for each dayboard system identified as "Fully acceptable" in the technical evaluation phase of this project. Data required for the analyses were obtained from a number of sources including: discussions with individuals at Coast Guard Headquarters, district offices, industrial bases, Coast Guard groups and bases, and aid-to-navigation teams; a review of data in the Aids-to-Navigation Information System (ATONIS); quotes from manufacturers of potential dayboard materials; and a review of previous Coast Guard reports on dayboard costs (References 1 & 2).

The following factors were considered in the life cycle cost analyses: costs of servicing, replacing, maintaining, and installing dayboards, including costs for personnel, ship use, and the costs of changing to a new dayboard system. Costs which vary significantly between different systems (fabrication costs for example) are identified and quantified. Costs which are independent of the system deployed (servicing costs for example) are discussed under assumptions but are not quantified.

3.2 Assumptions

Two important assumptions from NAVFAC P-442 affecting the life cycle cost analyses are:

- The cost of capital is 10% in government decisions.
- Sunk costs and depreciation are excluded in economic cost

analyses.

The following one-time costs are assumed sunk costs for dayboard systems: research and development costs, facility investment costs, working capital changes, value of existing assets employed or value of existing assets replaced, and terminal value. NAVFAC P-442 defines these terms in detail. What this means for the dayboard analysis is that there are no significant differences in any of these costs among any of the dayboard systems being evaluated. In other words, any one-time cost - averaged over the lifetime of the dayboard system - has negligible effect on the life cycle costs.

Costs which can vary significantly among systems are the recurring operating costs. These include: materials, supplies, and utilities; maintenance and repair; support costs, labor costs, recurring personnel costs, and other recurring costs such as spare parts. Again, these terms are defined by NAVFAC P-442. For dayboard systems, the important recurring costs are: material costs (backing, substrate, and retroreflective film); labor to construct dayboards; overhead on labor; maintenance and repair costs; and support costs. Specific assumptions for potential Coast Guard dayboard systems are as follows:

- Dayboard materials exist (or can be manufactured) to last 5 years in a marine environment.
- Overhead rate is 100% of labor costs.
- Labor rate is $10.81/hour based on average wages for a SN, PO3, WG5, WG6, and WG9.

- Assembly hours and manpower required are estimated and vary per dayboard system.
- Installation of new dayboard systems will be 50% in the first year and 50% in the second year (based on replacement rate of the current dayboard system.
- Conversion costs and new equipment required depends upon the type of system employed and for the purpose of this analysis is the same for all systems.
- Support costs: this analysis assumes that the Coast Guard is required to visit each dayboard site every two years, thereby negating any significant savings attributable to decreased maintenance requirements for an extended dayboard system life.
- Maintenance and repair costs are based on current data and information derived from the CGD-7 report dated 17 Oct 84.
- Currently dayboards are fabricated at bases and distributed to field units on available transportation. The distribution of dayboards from the base to the field would remain the same for all proposed systems.
- Centralized fabrication does not result in any identifiable increase in efficiency over the present method of constructing dayboards employed. Because materials are bought from either term contract or GSA schedule, there are no cost savings from bulk buying.

3.3 Summary of results

TABLE I

DAYBOARD INVENTORY BY DISTRICT

DISTRICT> TYPE:	CGD1	CGD2	CGD5	CGD7	CGD8	CGD9	CGD11	CGD13	CGD14	CGD17	TOTAL BY TYPE	% TOTAL	SQ FT	TOTAL SQ FT
3SG	270	575	3,731	5,116	1,460	308	427	128	143	128	12,286	31.8%	9	110,574
3JG	0	2	40	0	8	4	0	0	0	1	55	0.1%	9	495
3NR	29	0	42	0	0	7	22	4	4	13	121	0.3%	9	1,089
3NG	17	0	12	0	4	0	2	0	0	0	35	0.1%	9	315
3NB	0	0	62	0	0	8	1	1	11	0	83	0.2%	9	747
3NW	12	0	158	0	16	8	11	7	0	2	214	0.6%	9	1,926
3CG	0	1	0	0	2	0	0	0	0	0	3	0.0%	9	27
3CR	0	0	0	0	0	0	0	0	0	0	0	0.0%	9	0
3NY	0	0	2	0	0	0	11	2	0	0	15	0.0%	9	135
4SG	55	1,892	20	0	1,046	63	25	168	12	60	3,341	8.6%	16	53,456
4JG	4	5	4	0	6	0	0	2	3	0	24	0.1%	16	384
4NR	20	0	4	0	5	12	24	1	4	36	106	0.3%	16	1,696
4NB	8	0	6	0	21	2	3	6	13	0	59	0.2%	16	944
4NG	6	0	0	0	4	3	2	0	0	2	17	0.0%	16	272
4NW	10	0	42	0	2	7	0	14	0	0	75	0.2%	16	1,200
4CG	0	821	0	0	0	0	0	0	0	0	821	2.1%	16	13,136
4CR	0	831	0	0	0	0	0	0	0	0	831	2.2%	16	13,296
4NY	0	0	0	2	57	0	0	3	0	0	62	0.2%	16	992
4TR	319	2,274	3,730	5,074	1,540	310	498	273	134	180	14,332	37.1%	8	114,656
4JR	2	4	50	0	20	9	0	4	0	5	94	0.2%	8	752
4MB	0	0	4	0	0	0	0	0	0	0	4	0.0%	16	64
6SG	31	83	50	0	179	14	12	175	0	201	745	1.9%	36	26,820
6JG	0	0	0	0	5	0	0	3	0	0	8	0.0%	36	288
6NR	13	0	32	0	8	18	1	7	0	779	858	2.2%	36	30,888
6NG	19	0	4	0	2	0	0	4	0	9	38	0.1%	36	1,368
6NB	7	0	42	0	21	11	2	26	20	0	129	0.3%	36	4,644
6CG	0	182	0	0	0	0	0	0	0	0	182	0.5%	36	6,552
6CR	0	174	0	0	0	0	0	0	0	0	174	0.5%	36	6,264
6NW	4	0	14	0	0	3	0	3	0	0	24	0.1%	36	864
6NY	0	0	0	0	2	0	0	0	0	0	2	0.0%	36	72
6TR	12	94	40	0	1,037	27	25	76	10	156	1,477	3.8%	18	26,586
6JR	0	0	2	0	7	0	0	3	0	4	16	0.0%	18	288
8TR	30	93	24	0	114	5	10	89	0	98	463	1.2%	32	14,816
8JR	0	0	2	0	4	0	2	1	0	2	11	0.0%	32	352
8MB	0	0	2	0	0	0	0	0	0	0	2	0.0%	28	56
3K_ _	7	0	98	14	74	2	15	8	14	4	236	0.6%	18	4,248
4K_ _	15	0	208	4	109	34	48	63	32	24	537	1.4%	32	17,184
6K_ _	13	0	52	0	131	25	6	117	13	7	364	0.9%	72	26,208
8K_ _	5	0	18	390	99	35	0	107	6	2	662	1.7%	128	84,736
12K_ _	0	0	0	0	16	5	0	0	0	8	29	0.1%	288	8,352
NONSTNDRD	6	5	14	0	9	36	6	13	1	9	99	0.3%	5	495
TOTAL BY DISTRICT:	914	7,036	8,509	10,600	6,008	956	1,153	1,308	420	1,730				
TOTAL DAYBOARD;											38,634	DAYBOARDS		
TOTAL FT^2														576742
% TOTAL	2.4%	18.2%	22.0%	27.4%	15.6%	2.5%	3.0%	3.4%	1.1%	4.5%	100.0%	100.0%		SQ FT

SOURCE: ATONIS data supplied by Joe Favero, LTJG, USCG, NSR, WASHINGTON, D.C.

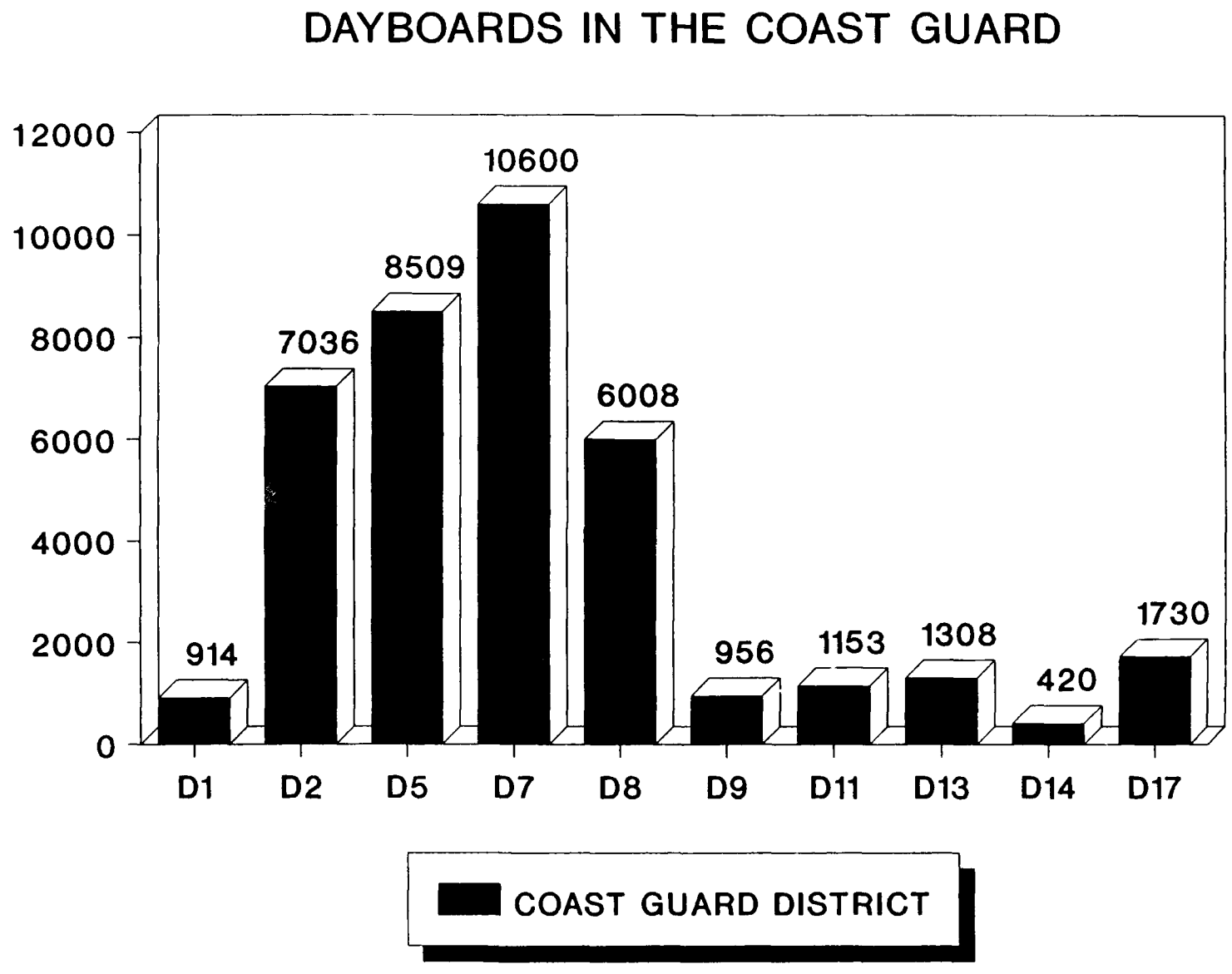
DAYBOARDS IN THE COAST GUARD
12000
10000
8000
6000
4000
2000
0
914
7036
8509
10600
6008
956
1153
1308
420
1730
D1
D2
D5
D7
D8
D9
D11
D13
D14
D17
COAST GUARD DISTRICT

FIGURE 1.0

Table I lists the dayboard inventory of the Coast Guard by district and by type of sign. Figure 1 summarizes and displays the same information in the bar graph. This information is a major input to estimating dayboard construction costs.

Table II details dayboard construction costs. Costs are subdivided into material, labor, overhead, and total costs. Annual costs and "average" dayboard costs are presented. It is important to note that changes in the estimates to paint dayboards by an half an hour will have approximately a 25% impact upon Net Present Value figures in table IV.

Table III uses the information from table II to compare the initial and annual costs of a typical Coast Guard dayboard. A "typical" Coast Guard dayboard is a 15 square foot size dayboard which is obtained from dividing the total square feet of dayboards (576,742 sq ft) in the system by the total number of dayboards (38,634). Annual costs are the initial costs divided by the expected dayboard life.

Table IV estimates life cycle costs for each dayboard system. The Net Present Value (NPV) is calculated at a 10% discount rate for the years 1992-2001. Appendix A provides spreadsheets showing how NPV is calculated for each dayboard system. NPV is normalized to the present system to allow for easy comparison between systems.

4.0 DISCUSSION OF RESULTS

4.1 Potential savings of new dayboard systems

Annual cost information from table II allows annual savings

SUMMARY OF TOTAL DAYBOARD CONSTRUCTION COSTS

A	B	C	D	E	F	G	H	I	J
SYSTEM	BACKING	SUBSTRATE	RETRO	LABOR	OVERHEAD	TOTAL SYSTEM COSTS	ANNUAL COSTS	AVERAGE DAYBOARD COST	NORM VALUE
1.SURLYN FOAM	$3,618,706	N/A	$194,877	N/A	N/A	$3,813,583	$635,597	$99.92	0.656029
2.ACRYLIC	$2,285,016	N/A	$194,877	$412,585	$412,585	$3,305,064	$550,844	$86.59	0.568551
3.SURLYN FOAM/FILM	$2,330,150	$547,905	$194,877	$206,293	$206,293	$3,485,517	$697,103	$91.32	0.719512
4.PRESENT SYSTEM	$444,735	$472,928	$194,877	$412,585	$412,585	$1,937,711	$968,855	$50.77	1.000000
5.FRP/FILM	$778,602	$547,905	$194,877	$206,293	$206,293	$1,933,969	$386,794	$50.67	0.399228
6.FIBERBOARD/FILM	$521,413	$547,905	$194,877	$412,585	$412,585	$2,089,366	$417,873	$54.74	0.431306
7.PLYWOOD/FILM	$973,816	$547,905	$194,877	$412,585	$412,585	$2,541,768	$508,354	$66.60	0.524695
8.FRP/PAINT	$778,602	$484,463	$194,877	$825,171	$825,171	$3,108,283	$518,047	$81.44	0.534700
9.FIBERBOARD/PAINT	$521,413	$484,463	$194,877	$825,171	$825,171	$2,851,095	$475,182	$74.70	0.490458
10.PLYWOOD/PAINT	$973,816	$553,672	$194,877	$825,171	$825,171	$3,372,706	$562,118	$88.37	0.580187
11.POLYURETHANE	$4,844,633	N/A	$194,877	N/A	N/A	$5,039,510	$839,918	$132.04	0.866918
12.ALUMINUM/FILM	$1,663,921	$547,905	$194,877	$412,585	$412,585	$3,231,874	$646,375	$84.68	0.667153
13.ALUMINUM/PAINT	$1,663,921	$322,976	$194,877	$825,171	$825,171	$3,832,115	$638,686	$100.40	0.659217

LEGEND

A - DAYBOARD SYSTEM
B - BACKING MATERIAL COST (23,962 X (32/sq ft) X $/ft) *SURLYN FOAM & POLYURETHANE BY DIRECT QUOTE
*FRP-$/FT X 576,742
C - SUBSTRATE MATERIAL COST (576,742 SQ FT X $/FT)
D - RETROFILM COST (RETRO COST/SIGN) X TOTAL # OF SIGNS)
E - LABOR COST (@$10.81/HOUR X # PEOPLE REQUIRED X HOURS/SIGN X # OF SIGNS)
F - OVERHEAD COST (100% OF LABOR)
G - B + C + D + E + F
H - G/ESTIMATED LIFE IN YEARS
I - G/# DAYBOARDS IN SYSTEM
J - NORMALIZED VALUE OF DAYBOARD COSTS: H/968,855

TABLE III

COMPARISON OF TYPICAL DAYBOARD COSTS (15 SQ FT)

TYPE OF SYSTEM	LIFE/YRS	INITIAL	ANNUAL COST
• FRP/FILM	5	$50.67	$10.13
• FIBERBOARD/FILM	5	$54.74	$10.95
• FIBERBOARD/PAINT	6	$74.70	$12.45
• PLYWOOD/FILM	5	$66.60	$13.32
• FRP/PAINT	6	$81.44	$13.57
• ACRYLIC	6	$86.59	$14.43
• PLYWOOD/PAINT	6	$88.37	$14.73
• SURLYN FOAM	6	$99.92	$16.65
• ALUMINUM/PAINT	6	$100.40	$16.73
• ALUMINUM/FILM	5	$84.68	$16.94
• SURLYN FOAM/FILM	5	$91.32	$18.26
• POLYURETHANE	6	$132.04	$22.01
• PRESENT SYSTEM	2	$50.77	$25.39

TABLE IV

ESTIMATED LIFE CYCLE COSTS OF DAYBOARD SYSTEMS

SYSTEM	NET PRESENT VALUE	NORMALIZED VALUE
1. FRP/FILM	$3,027,716	.496338
2. FIBERBOARD/FILM	$3,259,149	.534277
3. PLYWOOD/FILM	$3,932,911	.644728
4. FIBERBOARD/PAINT	$4,393,590	.720248
5. FRP/PAINT	$4,776,622	.783039
6. ACRYLIC	$4,917,407	.806118
7. ALUMINUM/FILM	$4,960,686	.813213
8. PLYWOOD/PAINT	$5,170,427	.847596
9. SURLYN FOAM/FILM	$5,177,841	.848812
10. SURLYN FOAM	$5,651,314	.926429
11. ALUMINUM/PAINT	$5,678,062	.930814
12. PRESENT SYSTEM	$6,100,101	1.000000
13. POLYURETHANE	$7,420,603	1.216472

ANNUAL SAVINGS DUE TO REDUCED CONSTRUCTION COSTS

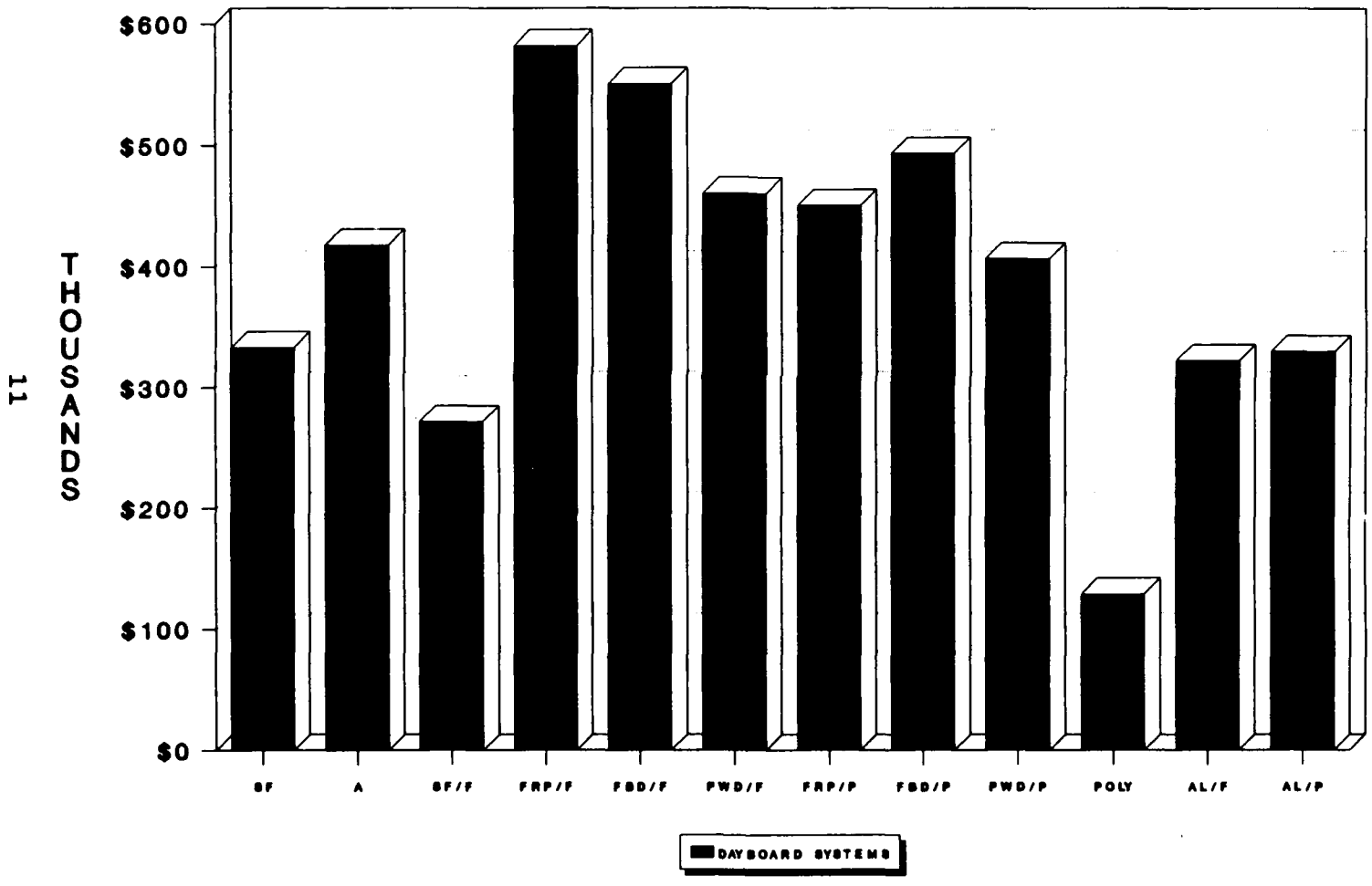

FIGURE 2.0

to be estimated for each dayboard system. These potential savings are plotted in figure 2.0. These savings are due to construction costs alone. Under the assumption that dayboards will be inspected every two years, no significant savings due to reduced servicing costs can be realized. However, if the inspection interval is increased to five years, potential savings due to reduced servicing costs are estimated to be $4.7M per year. This estimate is based on the "rule of thumb" that $6.00 in servicing funds must be budgeted for every hardware dollar spent for aids-to-navigation. Servicing costs for the present system would be $50.77/dayboard X 19,317 dayboards/year X $6.00/$1.00 = $5.8M per year. If this servicing cost is spread over five years, annual servicing costs for a "five-year" dayboard are $5.88M/5 = $1.18M. Potential savings are $5.88M - $1.18M = $4.70M.

One problem in estimating potential savings is establishing the price of the current dayboard system. For this analysis, assumptions for the present dayboard system included the following: average life of a dayboard is two years; dayboards are manufactured following the guidelines of G-ECV-300B "Specification for Manufacturing Dayboards"; dayboards consist of 1/2" A/C plywood, fluorescent and retroreflective film; dayboards are constructed by the appropriate wage grade personnel (SN, PO3, or WG5).

In reality, dayboard life in many districts is less than two years (1.35 years in CGD2), personnel constructing dayboards are of a higher wage grade than those assumed for this study, and many districts use 5/8" high density overlaid plywood to build

dayboards. All of these factors would increase the current costs of the present dayboard system. Further complicating the task of estimating current dayboard costs is the lack of accurate cost accounting data for dayboard production in each district. For example, CGD7 estimates the cost of a 3SG dayboard delivered to the field at $28.00. CGD2 estimates the same size sign as $46.00. The difference appears to be in how overhead is assigned to dayboard production. This was a problem cited in the TAMU (sited in reference 1) study of Dayboard Manufacturing Processes in 1974. The problem is also being encountered today by Coast Guard Headquarters personnel assigned the task of investigating the feasibility of contracting out for the production of dayboards.

Assuming the CGD2 price represents the true cost of producing dayboards, the construction cost of the present system could be as high as $1.44M per year (576,742/2 sq ft X $5/sq ft). This is 32% higher than the estimate in table II. Potential savings in figure 2 would double.

4.2 Effect of expected dayboard life

The major factor affecting the life cycle cost analyses is the expected dayboard life. This life is estimated based on a review of the manufacturers' specification data sheets and an analysis of available test documentation, in particular, actual field tests as opposed to laboratory tests. For this analysis, expected life is estimated to the closest whole number. During the next phase of the dayboard project, prototype dayboards will be built and tested. Based on the results of those tests, the expected dayboard life

will be estimated to the nearest half-year. Life cycle cost analyses will then be recomputed and presented in the final report.

4.3 Dayboard inventory

Table I is perhaps one of the more significant results of this dayboard analysis. The significance of the data in table I is that it allows the Coast Guard to concentrate its efforts to improve dayboard performance in the areas where the maximum benefits can be obtained. For example, the majority of dayboards are 3SG and 4TR. Contracting out for the production of these size dayboards would reduce the dayboard production requirements by Coast Guard personnel 69%. As another example of a way to use the data in table I, note that four districts produce over 83% of the dayboards. If a five-year dayboard is implemented in the Coast Guard, any of these districts would be a candidate for centralized production of dayboards. This could result in additional cost savings for the Coast Guard.

REFERENCES

1. "Systems Engineering Development Program to Study the Coast Guard Daymark Manufacturing in Detail, Define Its Problems Precisely and Devise Methods to Eliminate these Problems", Contract DOT-CG-31589-A (RF-996), Texas A&M University, Albert Pedulla-Architecture Research, Dr. M.J. Fox, Jr.-Industrial Engineering, 17 April 1974.

2. "Most Efficient Means To Supply Dayboards To District Aids To Navigation Units", J.M. Sherman, Chief, Civil Engineering Branch, 17 Oct 1984.

APPENDIX A

SUPPORTING COST DATA

AND CALCULATIONS FOR

LIFE CYCLE COST ANALYSES

OF DAYBOARDS

A.1 PRICING OF MATERIALS

GALVANIZED STEEL-RYERSON STEEL COMPANY

Type: ASTM A525
Sheet Size: 48" x 96"

12 gauge:	single sheet	= $108.67	(≈.75/#)
$4.53/#FT2:	20 or more	= 69.17	(≈.48/#)
14 gauge:	single sheet	= $ 91.41	(≈.87/#)
$3.28/#FT2:	20 or more	= 55.91	(≈.53/#)
16 gauge:	single sheet	= $ 75.49	(≈.89/#)
$2.66/#FT2:	20 or more	= 41.99	(≈.49/#)

NOTE: Quantity discounts do apply for 20 or more sheets.
Shipping costs to various locations will vary depending on location availability.
(Worst case scenario: see additional charges for aluminum)

ALUMINUM SHEET-RYERSON STEEL COMPANY

Type: 5086-H32 QQ-A-250/7

Sheet size availability limited to: 88" x 240"(.190" thick)
(will cut in half for shipping = $45.00 cutting charge)

To ship to Connecticut:
@ 2,500 # or more = $2.65/#
1 sheet = 386#

To ship to Seattle, WA:
Add $.05/#

To ship to Tulsa, OK or St. Louis, MO
Add $.02/# (+ Freight from Tulsa to New Orleans)

To ship to Charlotte, N.C.
Add $.01/# (+Freight to Miami, FL or Portsmouth, VA)

All 5086 Aluminum stocked in Chicago, IL
(Difficult to find stock in country-wide locations)

If single sheet is purchased for proto-types, Ryerson will offer same price as for quantities:
e.g. 1 each (88 x 240 x .190)@386 = $1,022.90

ALUMINUM SHEET-RYERSON STEEL COMPANY

Type: 5052-H34 QQ-A-250/8

Sheet size: (most readily available)
.100" thick (recommended) x 48" x 144" ($48ft^2$)

Stock normally available in: Chicago, IL/Boston, MA/Cleveland, OH/
Denver, CO/Houston, TX/Los Angeles, CA/
San Francisco, CA/Seattle, WA/Chattanooga, TN

Single sheet price: (.100" x 48 x 144) = $119.00 ea (≈ $1.75/#)
20 " " " = $104.00 ea (≈ $1.55/#)

*If material must be shipped to another "Ryerson" location (i.e. Charlotte, N.C.) price per pound may change:

up to 300 miles = +$.01/#
up to 500 miles = +$.02/#
up to 1500 miles = +$.05/#

Once material arrives at closest Ryerson warehouse, common carrier freight must be paid to destination.

Note: If aluminum is used in dayboard production, the USCG may negotiate with Ryerson to stock special types & sizes in various locations (Ryerson does this for many large customers).

PLYWOOD PRICING

Miami, FL: Georgia Pacific
1/2" Marine grade = $34.40 ea
(60 sheets) 1 unit= $32.80 ea
*No high density overlay

St. Louis, Missouri: Harrison Lumber
1/2" Marine grade = $38.40 ea
1 unit = $36.00 ea
MDO one side finish = $24.26 ea
1 unit = $22.62 ea

Portsmouth, VA: Seaport Plywood (Virginia Beach)
1/2" Marine grade (AB) = $35.99 ea
1/2" Marine grade (AB)10+ = $32.39 ea
1/2" Marine grade (AB)20+ = $31.49 ea

MDO one side finish = $24.93 ea
MDO one side finish 10+ = $22.43 ea
MDO one side finish 20+ = $21.81 ea
MDO one side finish 1 Unit = $21.19 ea

Seattle, WA: Greer Lumber
1/2" Marine grade (AA) = $45.82 ea

*Note: Lawrence Johnson (MGR) gives USCG special pricing

New Orleans, LA: Robichaux Lumber
1/2" Marine grade (AA) = $48.63 ea
1/2" Marine grade (AA) 10+ = $43.77 ea
1/2" Marine grade (AA) 1 unit = $41.34 ea

AVERAGE PRICE SINGLE SHEET 1/2" MARINE GRADE = $40.65

P/C EPOXY RESIN PAINT SYSTEM/PETERSON CHEMICAL CORPORATION

NOTE: X = fraction of solids per unit volume of liquid

A. Metal (Aluminum)

Primer——P/C EPOXY Lead Chromate Primer #2
PTA = $34.40/gl PTB = $34.40/gl
X = 83.89% X = 34.14%

*Finish—2 coats P/C EPOXY Paint....

Plus———P/C Non-ambering clear No. 1600 c-glaze
One pt comp = $34.40/gl
X = 40.00%

B. WOOD (HDOP, Marine grade, MDP-fiberboard)

Seal——P/C clear #10
PTA = $17.30/gl PTB = $17.30/gl
X = 21.6% X = 11.0%

Primer——P/C EPOXY Flat White Undercoat #4
PTA = $29.70/gl PTB = $29.70/gl
X = 70.5% X = 63.37%

*Finish—2 coats P/C EPOXY Paint....

2 Plus———P/C Non-ambering clear No. 1600 c-glaze
One pt comp = $34.40/gl
X = 40.00%

C. FIBERGLASS

Undercoat——Flat white undercoat #4
PT's A & B = $29.70/gl
PTA, X = 70.5% PTB, X = 63.32%

*Finish—2 coats P/C EPOXY Paint....

Plus———P/C Non-ambering clear No. 1600 c-glaze
One pt comp = $34.40/gl
X = 40.00%

*Epoxy Paints: 1) Std "off-the-shelf" non-flour. Int'l Orange:
PTA =(pigment)$37.50/gl PTB =(hdnr) $37.50/gl
X = 59.76% X = 26.68%
2) Std "off-the-shelf" fluorescent red & green:
PTA =(pigment)$46.10/gl PTB =(hdnr) $46.10/gl
X = 59.76% X = 26.68%

Note: If bought in 5 gallon container "$2.00/gal."
Over $5000.00 order "5%" discount.
*Specialty match set-up charges:
1-9 gl= $40.00
10-19 gl= $20.00
20+gl= No charge

(Cannot custom match fluorescent)

CALCULATIONS FOR PAINTING BACKINGS

Assumptions:

a. There are 231 $in.^3$ per liquid gallon.

b. There are (231 $in.^3$) X (percent volume solids) $in.^3$ of film forming solids per gallon.

c. Each $in.^3$ of solids yields 1000 $in.^2$ layers of 1 mil thick film or 1000/144 ft layers of 1 mil thick film.

d. (%solids by volume) X (231) X (1000)/144 = theoretical spreading rate in numbers of ft^2 film 1 mil thick.

e. The cost of each ft^2 of film, 1 mil thick is obtained, therefore, from the dollars per gallon of liquid coating divided by the number of ft^2 layers of 1 mil film calculated in step (d).

NOTE: To translate dollars per ft^2 of another film thickness, multiply the cost per mil by the film thickness desired. To translate theoretical spreading rate at 1 mil thickness into theoretical spreading rate at another thickness, divide the 1 mil spreading rate by the film thickness desired.

Let X = fraction of solids per unit volume of liquid

Coverage = (no.gals)(231 $in.^3$) X

$In.^3$ = (no. gals)(X)231 $in.^3$/gal

1 $in.^3$ solid = 1000 $in.^2$ (0.001 in.)ft^2 = .1

1 $in.^3$ solid @ .001 in. thick = 1000/144 $ft^2 \approx 7$ ft^2

COVERAGE/GAL = 231 X 7 = 231 X 1000/144

COVERAGE/GAL = 1600 X ft^2

GAL/SQ FT = 1/1600 X ft^2

$/SQ FT = 1/1600X x gal/sq ft, P$/gal = $\frac{P}{1600\ X}$ $/sq ft

FIBERGLASS: COST OF PAINT

1. Undercoat-flat white undercoat # 4

PTA = \$29.70/gl $\quad \frac{1}{1600\ (70.5\%)}\ (\$29.70/gl) = \$\ .0263/ft^2$

PTB = \$29.70/gl $\quad \frac{1}{1600\ (63.37\%)}\ (\$29.70/gl) = \$\ .0293/ft^2$

$\$\ .0556/ft^2$

2. Finish-2 coats P/C Epoxy Paint

PTA = \$46.10/gl $\quad \frac{1}{1600\ (59.76)}\ (\$46.10/gl) = \$\ .0482/ft^2$

PTB = \$46.10/gl $\quad \frac{1}{1600\ (26.68\%)}\ (\$46.10/gl) = \$\ .1079/ft^2$

$\$\ .1561/ft^2$

3. Plus P/C non-ambering clear # 1600

One PT = \$34.40/gl $\quad \frac{1}{1600\ (40.00\%)}\ (\$34.40/gl) = \$\ .0538/ft^2$

$\$.4216/ft^2$

METAL: COST OF PAINT

1. Primer-P/C Epoxy lead chromate primer #2

PTA = \$34.40/gl $\quad \frac{1}{1600\ (83.89\%)}\ (\$34.40/gl) = \$\ .0256/ft^2$

PTB = \$34.40/gl $\quad \frac{1}{1600\ (54.14\%)}\ (\$34.40/gl) = \$\ .0397/ft^2$

$\$\ .0653/ft^2$

2. Finish-2 coats P/C Epoxy Paint

PTA = \$46.10/gl $\quad \frac{1}{1600\ (59.76)}\ (\$46.10/gl) = \$\ .0482/ft^2$

PTB = \$46.10/gl $\quad \frac{1}{1600\ (26.68\%)}\ (\$46.10/gl) = \$\ .1079/ft^2$

$\$\ .1561/ft^2$

$\times \quad 2$

$\$\ .3122/ft^2$

3. Plus-P/C non-ambering clear # 1600

One PT = \$34.40/gl $\quad \frac{1}{1600\ (40.00\%)}\ (\$34.40/gl) = \$\ .0538/ft^2$

TOTAL = $\$\ .4216/ft^2$

WOOD: COST OF PAINT

1. Seal-P/C clear # 10

PTA = \$17.30/gl $\quad \frac{1}{1600\ (21.60\%)}\ (\$17.30/gl) = \$\ .0501/ft^2$

PTB = \$17.30/gl $\quad \frac{1}{1600\ (11.0\%)}\ (\$17.30/gl) = \$\ .0074/ft^2$

$\$\ .0575/ft^2$

2. Primer-P/C Epoxy flat white undercoat #4

PTA = \$29.70/gl $\quad \frac{1}{1600\ (70.50\%)}\ (\$29.70/gl) = \$\ .0263/ft^2$

PTB = \$29.70/gl $\quad \frac{1}{1600\ (63.37\%)}\ (\$29.70/gl) = \$\ .0293/ft^2$

$\$\ .0556/ft^2$

3. Finish-2 coats P/C Epoxy Paint

PTA = \$46.10/gl $\quad \frac{1}{1600\ (59.76)}\ (\$46.10/gl) = \$\ .0482/ft^2$

PTB = \$46.10/gl $\quad \frac{1}{1600\ (26.68\%)}\ (\$46.10/gl) = \$\ .1079/ft^2$

$\$\ .1561/ft^2$

$\times \quad 2$

$\$\ .3122/ft^2$

4. Plus-P/C non-ambering clear # 1600

One PT = \$34.40/gl $\quad \frac{1}{1600\ (40.00\%)}\ (\$34.40/gl) = \$\ .0538/ft^2$

TOTAL = $\$\ .4791/ft^2$

COST OF ELASTROMERIC VINYL FILM

Description: Opaque cast vinyl film, this film is intended for use in the extreme weather conditions with prolonged, high ultra violet radiation. This film shall retain its original color, dimensions, adhesion, and appearance for five years in this environment. This film shall meet the requirements of MIL-M-437198, TYPE III, CLASS 1 (Enclosure 2). This film shall have a permanent heat activated adhesive that meets the activation requirements of G-EOE-3398 (Enclosure 3). The contractor shall certify that when applied to aluminum or to high density exterior, marine grade plywood that has edge sealing, this film shall retain its original color, dimensions, adhesion, and appearance for five years in the above designated environment.

A. RED CAST VINYL FILM WITH TRISTIMULUS WITH COORDINATES
x = 0.6273; y = 0.3328; Y = 18.9 FOR A DAYLIGHT SOURCE

1) ROLL 24" WIDE X 50 YARDS LONG	04	RL	$285.00	$1140.00
2) ROLL 48" WIDE X 50 YARDS LONG	18	RL	$570.00	$10260.00

B. GREEN CAST VINYL FILM WITH TRISTIMULUS WITH COORDINATES
x = 0.3506; y = 0.5936; Y = 37.9 FOR A DAYLIGHT SOURCE

1) ROLL 24" WIDE X 50 YARDS LONG	04	RL	$285.00	$1140.00
2) ROLL 48" WIDE X 50 YARDS LONG	18	RL	$570.00	$10260.00

A. RED CAST VINYL FILM WITH TRISTIMULUS WITH COORDINATES

1) ROLL 24" WIDE X 50 YARDS LONG $285.00/150 FT = $1.95/2 = $.95 FT^2

2) ROLL 48" WIDE X 50 YARDS LONG $570.00/150 FT = $1.95/4 = $.95 FT^2

B. GREEN CAST VINYL FILM WITH TRISTIMULUS WITH COORDINATES

1) ROLL 24" WIDE X 50 YARDS LONG $285.00/150 FT = $1.95/2 = $.95 FT^2

2) ROLL 48" WIDE X 50 YARDS LONG $570.00/150 FT = $1.95/4 = $.95 FT^2

COST FT^2 = $.95

COST OF SURLYN FOAM

THE GILMAN CORPORATION

SOFTLITE IONOMER FOAM
FIVE YEAR DAYBOARD OPTIONS
RED OR GREEN

3SG:		FT^2
Foam and Film	$57.61/ea	$6.40
Film on Roll Up Substrate	35.76/ea	3.97
Foam Only	36.88/ea	4.10

4TR:		FT^2
Foam and Film	$49.22/ea	$6.19
Filmon Roll Up Substrate	30.37/ea	3.80
Foam Only	31.66/ea	3.96

Description of three forms of the material:

Foam and Film:
Five layers of semi-rigid, heat structured, U.V. pigmented, Type 400 Softlite with one internal scrim totalling 1 1/2" thick, welded to 1/16" U.V. pigmented Surlyn film covered with U.V. Acrylic high gloss clearcoat; total thickness 1 3/8".

Film on Roll Up Substrate:
One layer of U.V. pigmented Type 1000 Softlite 3/32" thick welded to 1/16" U.V. pigmented Surlyn film covered with U.V. Acrylic high gloss clearcoat total thickness 1/8".

Foam Only:
Five Layers of semi-rigid, heat structured, U.V. pigmented, Type 400 Softlite with one internal scrim total thickness 1 1/2".

NOTE: Quote does not include Retrofilm Border.

COST OF POLYURETHANE

1) 3SG: $75.60/EA

2) 4TR: $66.80/EA

3) AVERAGE: $ 8.40/FT^2

# OF DAYBOARDS	COST PER DAYBOARD	TOTAL COST
12812	$75.60	$968,587.20
5340	$66.80	$356,712.00
115408	$8.40	$969,427.20
77760	$8.40	$653,184.00
31122	$8.40	$261,424.80
32352	$8.40	$271,756.80
56	$8.40	$470.40
26208	$8.40	$220,147.20
84736	$8.40	$711,782.40
8352	$8.40	$70,156.80
	TOTAL SYSTEM COST:	$4,483,648.80

COST: FRP

1) 4 X 8, .135 in. thick = $ 43.20 (delivered)

= $ 1.35/ft^2

COST: ACRYLIC

1/8" $2.48/ft^2

3/32" $2.02/ft^2

A.2 CALCULATION OF LABOR RATE

NOTE: 1989 average monthly wages for United States Coast Guard personnel.

TIR	SN	PO3	WG5	WG6	WG9
<2 years	$814.00	$864.00	$804.00	$847.00	$950.00
>2 years	$858.00	$912.00	------	------	------
	$1672.00	$1776.00	$804.00	$847.00	$950.00
÷2 =	$836.00	$888.00	$804.00	$847.00	$950.00
+ 100% O/H	$836.00	$888.00	$804.00	$847.00	$950.00
	$1672.00	$1776.00	$1608.00	$1694.00	$1900.00
HOURLY AVERAGE:	$10.45	$11.10	$10.05	$10.59	$11.88

AVERAGE LABOR RATE: $10.81

A.3 ESTIMATED LIFE CYCLE COSTS FOR DAYBOARD SYSTEMS

- TEN YEAR PERIOD/PRESENT & PROPOSED SYSTEMS:
  Time period in which estimated life cycle costs have been analyzed.

- CONVERSION COSTS:
  Equipment required for new dayboard systems; regarded as immaterial for this analysis.

- FABRICATION COSTS:
  Material, labor and overhead costs as presented in Table II.

- MAINTENANCE & REPAIR COSTS:
  Based on CGD-7 study of annual costs to maintain building space and utility costs.

- SUPPORT COSTS:
  For this analysis it is assumed that the Coast Guard is required to visit each dayboard site every two years, thereby negating any significant savings attributable to decreased maintenance requirements for an extended dayboard system life.

- NPV @ 10% DISCOUNT RATE:
  IAW Chapter 5, NAVFAC P-442, "Economic Analysis Handbook", Government cost of capital.

- TOTAL COSTS:
  The sum of conversion, fabrication, maintenance & repair and support costs.

ESTIMATED LIFE CYCLE COSTS FOR DAYBOARD SYSTEMS
SURLYN FOAM (6 YEAR LIFE)

FISCAL YEAR	CONVERSION COSTS	FABRICATION COSTS "OLD" DBDS	FABRICATION COSTS "NEW" DBDS	MAINTENANCE & REPAIR COSTS	SUPPORT COSTS	TOTAL COSTS	10% DISCOUNT FACTOR	NET PRESENT VALUE
1992	$0.00	$0.00	$1,906,791.50	$24,000.00	$0.00	$1,930,791.50	0.909	$1,755,089.47
1993	$0.00	$0.00	$1,906,791.50	$24,000.00	$0.00	$1,930,791.50	0.826	$1,594,833.78
1994	$0.00	$0.00	$95,339.58	$24,000.00	$0.00	$119,339.58	0.751	$89,624.02
1995	$0.00	$0.00	$95,339.58	$24,000.00	$0.00	$119,339.58	0.683	$81,508.93
1996	$0.00	$0.00	$95,339.58	$24,000.00	$0.00	$119,339.58	0.621	$74,109.88
1997	$0.00	$0.00	$95,339.58	$24,000.00	$0.00	$119,339.58	0.564	$67,307.52
1998	$0.00	$0.00	$1,906,791.50	$24,000.00	$0.00	$1,930,791.50	0.513	$990,496.04
1999	$0.00	$0.00	$1,906,791.50	$24,000.00	$0.00	$1,930,791.50	0.467	$901,679.63
2000	$0.00	$0.00	$95,339.58	$24,000.00	$0.00	$119,339.58	0.424	$50,599.98
2001	$0.00	$0.00	$95,339.58	$24,000.00	$0.00	$119,339.58	0.386	$46,065.08
TOTALS	$0.00	$0.00	$8,199,203.45	$240,000.00	$0.00	$8,439,203.45	N/A	$5,651,314.33

ESTIMATED LIFE CYCLE COSTS FOR DAYBOARD SYSTEMS
ACRYLIC (6 YEAR LIFE)

FISCAL YEAR	CONVERSION COSTS	FABRICATION COSTS "OLD" DBDS	FABRICATION COSTS "NEW" DBDS	MAINTENANCE & REPAIR COSTS	SUPPORT COSTS	TOTAL COSTS	10% DISCOUNT FACTOR	NET PRESENT VALUE
1992	$0.00	$0.00	$1,652,532.00	$24,000.00	$0.00	$1,676,532.00	0.909	$1,523,967.59
1993	$0.00	$0.00	$1,652,532.00	$24,000.00	$0.00	$1,676,532.00	0.826	$1,384,815.43
1994	$0.00	$0.00	$82,626.60	$24,000.00	$0.00	$106,626.60	0.751	$80,076.58
1995	$0.00	$0.00	$82,626.60	$24,000.00	$0.00	$106,626.60	0.683	$72,825.97
1996	$0.00	$0.00	$82,626.60	$24,000.00	$0.00	$106,626.60	0.621	$66,215.12
1997	$0.00	$0.00	$82,626.60	$24,000.00	$0.00	$106,626.60	0.564	$60,137.40
1998	$0.00	$0.00	$1,652,532.00	$24,000.00	$0.00	$1,676,532.00	0.513	$860,060.92
1999	$0.00	$0.00	$1,652,532.00	$24,000.00	$0.00	$1,676,532.00	0.467	$782,940.44
2000	$0.00	$0.00	$82,626.60	$24,000.00	$0.00	$106,626.60	0.424	$45,209.68
2001	$0.00	$0.00	$82,626.60	$24,000.00	$0.00	$106,626.60	0.386	$41,157.87
TOTALS	$0.00	$0.00	$7,105,887.60	$240,000.00	$0.00	$7,345,887.60	N/A	$4,917,406.99

ESTIMATED LIFE CYCLE COSTS FOR DAYBOARD SYSTEMS
SURLYN FOAM/FILM (5 YEAR LIFE)

FISCAL YEAR	CONVERSION COSTS	FABRICATION COSTS "OLD" DBDS	FABRICATION COSTS "NEW" DBDS	MAINTENANCE & REPAIR COSTS	SUPPORT COSTS	TOTAL COSTS	10% DISCOUNT FACTOR	NET PRESENT VALUE
1992	$0.00	$0.00	$1,742,758.50	$24,000.00	$0.00	$1,766,758.50	0.909	$1,605,983.48
1993	$0.00	$0.00	$1,742,758.50	$24,000.00	$0.00	$1,766,758.50	0.826	$1,459,342.52
1994	$0.00	$0.00	$87,137.93	$24,000.00	$0.00	$111,137.93	0.751	$83,464.58
1995	$0.00	$0.00	$87,137.93	$24,000.00	$0.00	$111,137.93	0.683	$75,907.20
1996	$0.00	$0.00	$87,137.93	$24,000.00	$0.00	$111,137.93	0.621	$69,016.65
1997	$0.00	$0.00	$87,137.93	$24,000.00	$0.00	$111,137.93	0.564	$62,681.79
1998	$0.00	$0.00	$1,742,758.50	$24,000.00	$0.00	$1,766,758.50	0.513	$906,347.11
1999	$0.00	$0.00	$1,742,758.50	$24,000.00	$0.00	$1,766,758.50	0.467	$825,076.22
2000	$0.00	$0.00	$87,137.93	$24,000.00	$0.00	$111,137.93	0.424	$47,122.48
2001	$0.00	$0.00	$87,137.93	$24,000.00	$0.00	$111,137.93	0.386	$42,899.24
TOTALS	$0.00	$0.00	$7,493,861.55	$240,000.00	$0.00	$7,733,861.55	N/A	$5,177,841.27

ESTIMATED LIFE CYCLE COSTS FOR DAYBOARD SYSTEMS
PRESENT SYSTEM: A/C PLYWOOD/FLUORESCENT FILM(2 YEAR LIFE)

FISCAL YEAR	CONVERSION COSTS	FABRICATION COSTS "OLD" DBDS	FABRICATION COSTS "NEW" DBDS	MAINTENANCE & REPAIR COSTS	SUPPORT COSTS	TOTAL COSTS	10% DISCOUNT FACTOR	NET PRESENT VALUE
1992	$0.00	$968,855.00	$0.00	$24,000.00	$0.00	$992,855.00	0.909	$902,505.20
1993	$0.00	$968,855.00	$0.00	$24,000.00	$0.00	$992,855.00	0.826	$820,098.23
1994	$0.00	$968,855.00	$0.00	$24,000.00	$0.00	$992,855.00	0.751	$745,634.11
1995	$0.00	$968,855.00	$0.00	$24,000.00	$0.00	$992,855.00	0.683	$678,119.97
1996	$0.00	$968,855.00	$0.00	$24,000.00	$0.00	$992,855.00	0.621	$616,562.96
1997	$0.00	$968,855.00	$0.00	$24,000.00	$0.00	$992,855.00	0.564	$559,970.22
1998	$0.00	$968,855.00	$0.00	$24,000.00	$0.00	$992,855.00	0.513	$509,334.62
1999	$0.00	$968,855.00	$0.00	$24,000.00	$0.00	$992,855.00	0.467	$463,663.29
2000	$0.00	$968,855.00	$0.00	$24,000.00	$0.00	$992,855.00	0.424	$420,970.52
2001	$0.00	$968,855.00	$0.00	$24,000.00	$0.00	$992,855.00	0.386	$383,242.03
TOTALS	$0.00	$9,688,550.00	$0.00	$240,000.00	$0.00	$9,928,550.00	N/A	$6,100,101.12

ESTIMATED LIFE CYCLE COSTS FOR DAYBOARD SYSTEMS
FRP/FILM (5 YEAR LIFE)

FISCAL YEAR	CONVERSION COSTS	FABRICATION COSTS "OLD" DBDS	FABRICATION COSTS "NEW" DBDS	MAINTENANCE & REPAIR COSTS	SUPPORT COSTS	TOTAL COSTS	10% DISCOUNT FACTOR	NET PRESENT VALUE
1992	$0.00	$0.00	$966,984.50	$24,000.00	$0.00	$990,984.50	0.909	$900,804.91
1993	$0.00	$0.00	$966,984.50	$24,000.00	$0.00	$990,984.50	0.826	$818,553.20
1994	$0.00	$0.00	$48,349.23	$24,000.00	$0.00	$72,349.23	0.751	$54,334.27
1995	$0.00	$0.00	$48,349.23	$24,000.00	$0.00	$72,349.23	0.683	$49,414.52
1996	$0.00	$0.00	$48,349.23	$24,000.00	$0.00	$72,349.23	0.621	$44,928.87
1997	$0.00	$0.00	$966,984.50	$24,000.00	$0.00	$990,984.50	0.564	$558,915.26
1998	$0.00	$0.00	$966,984.50	$24,000.00	$0.00	$990,984.50	0.513	$508,375.05
1999	$0.00	$0.00	$48,349.23	$24,000.00	$0.00	$72,349.23	0.467	$33,787.09
2000	$0.00	$0.00	$48,349.23	$24,000.00	$0.00	$72,349.23	0.424	$30,676.07
2001	$0.00	$0.00	$48,349.23	$24,000.00	$0.00	$72,349.23	0.386	$27,926.80
TOTALS	$0.00	$0.00	$4,158,033.35	$240,000.00	$0.00	$4,398,033.35	N/A	$3,027,716.03

ESTIMATED LIFE CYCLE COSTS FOR DAYBOARD SYSTEMS
FIBERBOARD/FILM (5 YEAR LIFE)

FISCAL YEAR	CONVERSION COSTS	FABRICATION COSTS "OLD" DBDS	FABRICATION COSTS "NEW" DBDS	MAINTENANCE & REPAIR COSTS	SUPPORT COSTS	TOTAL COSTS	10% DISCOUNT FACTOR	NET PRESENT VALUE
1992	$0.00	$0.00	$1,044,683.00	$24,000.00	$0.00	$1,068,683.00	0.909	$971,432.85
1993	$0.00	$0.00	$1,044,683.00	$24,000.00	$0.00	$1,068,683.00	0.826	$882,732.16
1994	$0.00	$0.00	$52,234.15	$24,000.00	$0.00	$76,234.15	0.751	$57,251.85
1995	$0.00	$0.00	$52,234.15	$24,000.00	$0.00	$76,234.15	0.683	$52,067.92
1996	$0.00	$0.00	$52,234.15	$24,000.00	$0.00	$76,234.15	0.621	$47,341.41
1997	$0.00	$0.00	$1,044,683.00	$24,000.00	$0.00	$1,068,683.00	0.564	$602,737.21
1998	$0.00	$0.00	$1,044,683.00	$24,000.00	$0.00	$1,068,683.00	0.513	$548,234.38
1999	$0.00	$0.00	$52,234.15	$24,000.00	$0.00	$76,234.15	0.467	$35,601.35
2000	$0.00	$0.00	$52,234.15	$24,000.00	$0.00	$76,234.15	0.424	$32,323.28
2001	$0.00	$0.00	$52,234.15	$24,000.00	$0.00	$76,234.15	0.386	$29,426.38
TOTALS	$0.00	$0.00	$4,492,136.90	$240,000.00	$0.00	$4,732,136.90	N/A	$3,259,148.78

ESTIMATED LIFE CYCLE COSTS FOR DAYBOARD SYSTEMS
PLYWOOD/FILM (5 YEAR LIFE)

FISCAL YEAR	CONVERSION COSTS	FABRICATION COSTS "OLD" DBDS	FABRICATION COSTS "NEW" DBDS	MAINTENANCE & REPAIR COSTS	SUPPORT COSTS	TOTAL COSTS	10% DISCOUNT FACTOR	NET PRESENT VALUE
1992	$0.00	$0.00	$1,270,884.00	$24,000.00	$0.00	$1,294,884.00	0.909	$1,177,049.56
1993	$0.00	$0.00	$1,270,884.00	$24,000.00	$0.00	$1,294,884.00	0.826	$1,069,574.18
1994	$0.00	$0.00	$63,544.20	$24,000.00	$0.00	$87,544.20	0.751	$65,745.69
1995	$0.00	$0.00	$63,544.20	$24,000.00	$0.00	$87,544.20	0.683	$59,792.69
1996	$0.00	$0.00	$63,544.20	$24,000.00	$0.00	$87,544.20	0.621	$54,364.95
1997	$0.00	$0.00	$1,270,884.00	$24,000.00	$0.00	$1,294,884.00	0.564	$730,314.58
1998	$0.00	$0.00	$1,270,884.00	$24,000.00	$0.00	$1,294,884.00	0.513	$664,275.49
1999	$0.00	$0.00	$63,544.20	$24,000.00	$0.00	$87,544.20	0.467	$40,883.14
2000	$0.00	$0.00	$63,544.20	$24,000.00	$0.00	$87,544.20	0.424	$37,118.74
2001	$0.00	$0.00	$63,544.20	$24,000.00	$0.00	$87,544.20	0.386	$33,792.06
TOTALS	$0.00	$0.00	$5,464,801.20	$240,000.00	$0.00	$5,704,801.20	N/A	$3,932,911.08

ESTIMATED LIFE CYCLE COSTS FOR DAYBOARD SYSTEMS
PMP PAINT (6 YEAR LIFE)

FISCAL YEAR	CONVERSION COSTS	FABRICATION COSTS "COLD" DRDS	FABRICATION COSTS "NEW" DRDS	MAINTENANCE & REPAIR COSTS	SUPPORT COSTS	TOTAL COSTS	LCC DISCOUNT FACTOR	NET PRESENT VALUE
[illegible]	$0.00	$0.00	$1,[illegible].00	$2,[illegible].00	$0.00	$1,[illegible].00	0.9091	$1,[illegible].62
[illegible]	$0.00	$0.00	$1,[illegible].00	$2,[illegible].00	$0.00	$1,[illegible].00	0.8264	$1,[illegible].88
[illegible]	$0.00	$0.00	$[illegible].00	$2,[illegible].00	$0.00	$[illegible].00	0.7513	$[illegible].01
[illegible]	$0.00	$0.00	$[illegible].00	$2,[illegible].00	$0.00	$[illegible].00	0.6830	$[illegible].91
[illegible]	$0.00	$0.00	$[illegible].00	$2,[illegible].00	$0.00	$[illegible].00	0.6209	$[illegible].04
[illegible]	$0.00	$0.00	$1,[illegible].00	$2,[illegible].00	$0.00	$1,[illegible].00	0.5645	$[illegible].81
[illegible]	$0.00	$0.00	$1,[illegible].00	$2,[illegible].00	$0.00	$1,[illegible].00	0.5132	$[illegible].59
[illegible]	$0.00	$0.00	$[illegible].00	$2,[illegible].00	$0.00	$[illegible].00	0.4665	$[illegible].20
[illegible]	$0.00	$0.00	$[illegible].00	$2,[illegible].00	$0.00	$[illegible].00	0.4241	$[illegible].01
[illegible]	$0.00	$0.00	$[illegible].00	$2,[illegible].00	$0.00	$[illegible].00	0.3855	$[illegible].91
TOTALS	$0.00	$0.00	$6,[illegible].00	$12,[illegible].00	$0.00	$6,[illegible].00	N/A	$[illegible].81

ESTIMATED LIFE CYCLE COSTS FOR DATABOARD SYSTEMS
FIBERBOARD PANEL (6 YEAR LIFE)

FISCAL YEAR	CONVERSION COSTS	FABRICATION COSTS "OLD" BRDS	FABRICATION COSTS "NEW" BRDS	MAINTENANCE & REPAIR COSTS	SUPPORT COSTS	TOTAL COSTS	10% DISCOUNT FACTOR	NET PRESENT VALUE
[illegible]	$0.00	$0.00	$1,623,567.00	$26,000.00	$0.00	$1,649,567.00	0.909	$1,[illegible],618.22
[illegible]	$0.00	$0.00	$1,623,567.00	$26,000.00	$0.00	$1,649,567.00	0.826	$1,[illegible]
[illegible]	$0.00	$0.00	$211,2[illegible]	$26,000.00	$0.00	$237,2[illegible]	0.[illegible]	$[illegible].29
[illegible]	$0.00	$0.00	$211,2[illegible]	$26,000.00	$0.00	$237,2[illegible]	0.683	$[illegible]
[illegible]	$0.00	$0.00	$211,2[illegible]	$26,000.00	$0.00	$237,2[illegible]	0.621	$[illegible]
[illegible]	$0.00	$0.00	$1,623,567.00	$26,000.00	$0.00	$1,649,567.00	0.[illegible]	$[illegible]
[illegible]	$0.00	$0.00	$1,623,567.00	$26,000.00	$0.00	$1,649,567.00	0.[illegible]	$[illegible]
[illegible]	$0.00	$0.00	$211,2[illegible]	$26,000.00	$0.00	$237,2[illegible]	0.46[illegible]	$[illegible]
[illegible]	$0.00	$0.00	$211,2[illegible]	$26,000.00	$0.00	$237,2[illegible]	0.4[illegible]	$[illegible].40
[illegible]	$0.00	$0.00	$211,2[illegible]	$26,000.00	$0.00	$237,2[illegible]	0.386	$[illegible].06
TOTALS	$0.00	$0.00	$6,[illegible]	$[illegible]	$0.00	$6,[illegible]	N/A	$[illegible]

ESTIMATED LIFE CYCLE COSTS FOR DAYBOARD SYSTEMS
PLYWOOD PAINT (6 YEAR LIFE)

FISCAL YEAR	CONVERSION COSTS	FABRICATION COSTS "OLD" DBDS	FABRICATION COSTS "NEW" DBDS	MAINTENANCE & REPAIR COSTS	SUPPORT COSTS	TOTAL COSTS	10% DISCOUNT FACTOR	NET PRESENT VALUE
1992	$0 00	$0 00	$1 686 353 00	$24 000 00	$0 00	$1 710 353 00	0 909	$1 554 710 88
1993	$0 00	$0 00	$1 686 353 00	$24 000 00	$0 00	$1 710 353 00	0 826	$1 412 751 58
1994	$0 00	$0 00	$84 317 65	$24 000 00	$0 00	$108 317 65	0 751	$81 346 56
1995	$0 00	$0 00	$84 317 65	$24 000 00	$0 00	$108 317 65	0 683	$73 980 95
1996	$0 00	$0 00	$84 317 65	$24 000 00	$0 00	$108 317 65	0 621	$67 265 26
1997	$0 00	$0 00	$1 686 353 00	$24 000 00	$0 00	$1 710 353 00	0 564	$964 639 09
1998	$0 00	$0 00	$1 686 353 00	$24 000 00	$0 00	$1 710 353 00	0 513	$877 411 09
1999	$0 00	$0 00	$84 317 65	$24 000 00	$0 00	$108 317 65	0 467	$50 584 34
2000	$0 00	$0 00	$84 317 65	$24 000 00	$0 00	$108 317 65	0 424	$45 926 68
2001	$0 00	$0 00	$84 317 65	$24 000 00	$0 00	$108 317 65	0 386	$41 810 61
TOTALS	$0 00	$0 00	$7 251 317 90	$240 000 00	$0 00	$7 491 317 90	N/A	$5 170 427 05

ESTIMATED LIFE CYCLE COSTS FOR DAYBOARD SYSTEMS
POLYURETHANE (6 YEAR LIFE)

FISCAL YEAR	CONVERSION COSTS	FABRICATION COSTS "OLD" DBDS	FABRICATION COSTS "NEW" DBDS	MAINTENANCE & REPAIR COSTS	SUPPORT COSTS	TOTAL COSTS	10% DISCOUNT FACTOR	NET PRESENT VALUE
1992	$0.00	$0.00	$2,519,755.00	$24,000.00	$0.00	$2,543,755.00	0.909	$2,312,273.30
1993	$0.00	$0.00	$2,519,755.00	$24,000.00	$0.00	$2,543,755.00	0.826	$2,101,141.63
1994	$0.00	$0.00	$125,987.75	$24,000.00	$0.00	$149,987.75	0.751	$112,640.80
1995	$0.00	$0.00	$125,987.75	$24,000.00	$0.00	$149,987.75	0.683	$102,441.63
1996	$0.00	$0.00	$125,987.75	$24,000.00	$0.00	$149,987.75	0.621	$93,142.39
1997	$0.00	$0.00	$125,987.75	$24,000.00	$0.00	$149,987.75	0.564	$84,593.09
1998	$0.00	$0.00	$2,519,755.00	$24,000.00	$0.00	$2,543,755.00	0.513	$1,304,946.32
1999	$0.00	$0.00	$2,519,755.00	$24,000.00	$0.00	$2,543,755.00	0.467	$1,187,933.59
2000	$0.00	$0.00	$125,987.75	$24,000.00	$0.00	$149,987.75	0.424	$63,594.81
2001	$0.00	$0.00	$125,987.75	$24,000.00	$0.00	$149,987.75	0.386	$57,895.27
TOTALS	$0.00	$0.00	$10,834,946.50	$240,000.00	$0.00	$11,074,946.50	N/A	$7,420.602.82

ESTIMATED LIFE CYCLE COSTS FOR DAYBOARD SYSTEMS
ALUMINUM/PAINT (6 YEAR LIFE)

FISCAL YEAR	CONVERSION COSTS	FABRICATION COSTS "OLD" DBDS	FABRICATION COSTS "NEW" DBDS	MAINTENANCE & REPAIR COSTS	SUPPORT COSTS	TOTAL COSTS	10% DISCOUNT FACTOR	NET PRESENT VALUE
1992	$0.00	$0.00	$1,916,058.00	$24,000.00	$0.00	$1,940,058.00	0.909	$1,763,512.72
1993	$0.00	$0.00	$1,916,058.00	$24,000.00	$0.00	$1,940,058.00	0.826	$1,602,487.91
1994	$0.00	$0.00	$95,802.90	$24,000.00	$0.00	$119,802.90	0.751	$89,971.98
1995	$0.00	$0.00	$95,802.90	$24,000.00	$0.00	$119,802.90	0.683	$81,825.38
1996	$0.00	$0.00	$95,802.90	$24,000.00	$0.00	$119,802.90	0.621	$74,397.60
1997	$0.00	$0.00	$95,802.90	$24,000.00	$0.00	$119,802.90	0.564	$67,568.84
1998	$0.00	$0.00	$1,916,058.00	$24,000.00	$0.00	$1,940,058.00	0.513	$995,249.75
1999	$0.00	$0.00	$1,916,058.00	$24,000.00	$0.00	$1,940,058.00	0.467	$906,007.09
2000	$0.00	$0.00	$95,802.90	$24,000.00	$0.00	$119,802.90	0.424	$50,796.43
2001	$0.00	$0.00	$95,802.90	$24,000.00	$0.00	$119,802.90	0.386	$46,243.92
TOTALS	$0.00	$0.00	$8,239,049.40	$240,000.00	$0.00	$8,479,049.40	N/A	$5,678,061.61

ESTIMATED LIFE CYCLE COSTS FOR DAYBOARD SYSTEMS
ALUMINUM/FILM (5 YEAR LIFE)

FISCAL YEAR	CONVERSION COSTS	FABRICATION COSTS "OLD" DBDS	FABRICATION COSTS "NEW" DBDS	MAINTENANCE & REPAIR COSTS	SUPPORT COSTS	TOTAL COSTS	10% DISCOUNT FACTOR	NET PRESENT VALUE
1992	$0.00	$0.00	$1,615,937.00	$24,000.00	$0.00	$1,639,937.00	0.909	$1,490,702.73
1993	$0.00	$0.00	$1,615,937.00	$24,000.00	$0.00	$1,639,937.00	0.826	$1,354,587.96
1994	$0.00	$0.00	$80,796.85	$24,000.00	$0.00	$104,796.85	0.751	$78,702.43
1995	$0.00	$0.00	$80,796.85	$24,000.00	$0.00	$104,796.85	0.683	$71,576.25
1996	$0.00	$0.00	$80,796.85	$24,000.00	$0.00	$104,796.85	0.621	$65,078.84
1997	$0.00	$0.00	$1,615,937.00	$24,000.00	$0.00	$1,639,937.00	0.564	$924,924.47
1998	$0.00	$0.00	$1,615,937.00	$24,000.00	$0.00	$1,639,937.00	0.513	$841,287.68
1999	$0.00	$0.00	$80,796.85	$24,000.00	$0.00	$104,796.85	0.467	$48,940.13
2000	$0.00	$0.00	$80,796.85	$24,000.00	$0.00	$104,796.85	0.424	$44,433.86
2001	$0.00	$0.00	$80,796.85	$24,000.00	$0.00	$104,796.85	0.386	$40,451.58
TOTALS	$0.00	$0.00	$6,948,529.10	$240,000.00	$0.00	$7,188,529.10	N/A	$4,960,585.95